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EXAMINER	
MCLAREN, STEPHANIE D	

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3744	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/595,294	INNES, RODNEY MITCHELL	
	Examiner	**Art Unit**	
	STEPHANIE MCLAREN	3744	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 October 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-51* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-51* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *05 April 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *4/5/06*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 10, 14, 15, 16, 18, 20, 28, 37, 40, 41, 42, 44, and 46 are rejected under 35 U.S.C. 102(b) as being anticipated by Pandaru et al. (6,318,107).

With regards to claim 1, Pandaru et al. disclose: a heat pump apparatus comprising an evaporator means (4), a control means (10) in communication with at least one sensor means (8) adapted to measure one or more variables representative of a temperature of an outer surface of the evaporator means, and a heat exchanger (5) means operable to add heat from a working fluid from a high pressure side of the heat pump apparatus to the working fluid entering the evaporator means (col. 4, line 47-52), wherein the control means is operatively connected with the heat exchanger means to add the heat when the control means determines that the temperature of the outer surface of the evaporator means is below a pre-selected temperature (col. 4, line 40-43), thereby reducing or substantially eliminating the formation of ice on the outer surface of the evaporator means.

With regards to claim 10, Pandaru et al. disclose: a system further comprising a compressor (1) and a condenser (2) and where the heat exchanger means (5) obtains heat from the working fluid between the compressor and the condenser to transfer the heat to the working fluid entering the evaporator means (see fig. 3).

With regards to claim 14, Pandaru et al. disclose: a method of operating a heat pump having an evaporator (4) downstream of an expansion means (3), the method comprising obtaining heat as required from a working fluid on a high pressure side of the heat pump (via heat exchanger (5)) to transfer to the working fluid on a low pressure side of the heat pump, prior to the working fluid entering the evaporator to reduce or substantially prevent ice from forming on the outer surface of the evaporator (see fig. 3).

With regards to claim 15, Pandaru et al. disclose: wherein the method comprises measuring one or more variables representative of a temperature of an outer surface of the evaporator (via defrost sensor (8)) and adding the heat to the working fluid entering the evaporator (via heat exchanger (5)) when the one or more variables indicate that the temperature has dropped below a pre-selected minimum (col. 4, line 40-43).

With regards to claim 16, Pandaru et al. disclose: wherein the method further comprises providing a controller (10) to determine when icing of the evaporator is imminent based on the measurement of one or more variables.

With regards to claim 18, Pandaru et al. disclose: wherein the high pressure side is between a compressor and a condenser of heat pump (see fig. 3).

With regards to claim 20, Pandaru et al. disclose: wherein the method comprises adding heat to the working fluid while the heat pump is in operation (col. 5, line 7-9).

With regards to claim 28, Pandaru et al. disclose: heat pump apparatus comprising an evaporator (4), a controller (10) in communication with at least one sensor (8) adapted to measure one or more variables representative of a temperature of an outer surface of the evaporator, and a heat exchanger (5) operable to add heat from a working fluid from a high pressure side of the heat pump apparatus to the working fluid entering the evaporator (col. 4, line 47-52), wherein the controller is operatively connected with the heat exchanger to add the heat when the controller determines that the temperature of the outer surface of the evaporator is below a pre-selected temperature (col. 4, line 40-43), thereby reducing or substantially eliminating the formation of ice on the outer surface of the evaporator.

With regards to claim 37, Pandaru et al. disclose: further comprising a compressor (1) and a condenser (2) and where the heat exchanger (5) obtains heat from the working fluid between the compressor and the condenser to transfer the heat to the working fluid entering the evaporator (see fig. 3).

With regards to claim 40, Pandaru et al. disclose: a method of operating a heat pump having an evaporator (4) downstream of an expansion valve (3), the method comprising obtaining heat as required from a working fluid on a high pressure side of the heat pump to transfer to the working fluid on a low pressure side of the heat pump (via heat exchanger (5)), prior to the working fluid entering the evaporator to reduce or substantially prevent ice from forming on the outer surface of the evaporator (see fig. 3).

With regards to claim 41, Pandaru et al. disclose: wherein the method comprises measuring one or more variables representative of a temperature of an outer surface of the evaporator (via defrost sensor (8)) and adding the heat to the working fluid entering the evaporator (via heat exchanger (5)) when the one or more variables indicate that the temperature has dropped below a pre-selected minimum (col. 4, line 40-43).

With regards to claim 42, Pandaru et al. disclose: wherein the method further comprises providing a controller (10) to determine when icing of the evaporator is imminent based on the measurement of one or more variables.

With regards to claim 44, Pandaru et al. disclose: wherein the high pressure side is between a compressor (1) and a condenser (2) of heat pump (see fig. 3).

With regards to claim 46, Pandaru et al. disclose: adding heat to the working fluid while the heat pump is in operation (col. 5, line 7-9).

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 3, 4, 5, 6, 12, 19, 30, 31, 32, 33, 39 and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pandaru et al..

With regards to claim 3, Pandaru et al. fail to explicitly disclose: wherein the at least one sensor means comprises a temperature sensor adapted to measure the temperature of the outer surface of the evaporator means. Pandaru merely says that the variable measured by the defrost sensor should be indicative of evaporator temperature. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention that the temperature on the surface of the evaporator pipes would be indicative of evaporator temperature because as the ice buildup on the pipes increases, the convection heat exchange of the evaporator will decrease, and the working fluid will no longer absorb heat from it's environment to warm the evaporator pipes.

With regards to claim 4, Pandaru et al. fail to explicitly disclose: wherein the at least one sensor means comprises a temperature sensor adapted to measure the temperature of the working fluid exiting the evaporator means. Pandaru merely says that the variable measured by the defrost sensor should be indicative of evaporator temperature. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention that the temperature of the working fluid in the evaporator pipes would be indicative of evaporator temperature because as the ice buildup on the pipes increases, the convection heat exchange of the evaporator will decrease, and the working fluid will no longer absorb heat from it's environment to increase it’s temperature.

With regards to claim 5, Pandaru et al. fail to explicitly disclose: wherein the at least one sensor means comprises a temperature sensor adapted to measure the temperature of the environment surrounding the evaporator means. Pandaru merely says that the variable measured by the defrost sensor should be indicative of evaporator temperature. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention that the temperature of the environment surrounding the evaporator would be indicative of evaporator temperature because as the ice buildup on the evaporator pipes increases, the temperature of the surroundings will also increase, as the working fluid will no longer absorb heat from it’s environment, further cooling it.

With regards to claim 6, Pandaru et al. fail to explicitly disclose: wherein the at least one sensor means comprises a pressure sensor adapted to measure the pressure of the working fluid exiting the evaporator means. Pandaru merely says that the variable measured by the defrost sensor should be indicative of evaporator temperature. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention that the pressure of the working fluid exiting the evaporator would be indicative of the temperature of the evaporator, because temperature and pressure are directly correlated, as illustrated by the Ideal Gas Law, $PV=nRT$, and as the ice buildup on the pipes increases, the convection heat exchange of the evaporator will decrease, meaning the working fluid will no longer absorb heat from it's environment to increase it's temperature.

With regards to claim 12, Pandaru et al. disclose: wherein the heat exchanger means comprises a tube (leading to condenser (2)) positioned in an outer housing (surrounding heat exchange tank (5)), the working fluid from the high pressure side being caused to flow through the tube to add heat to the working fluid (in heat exchanger housing/pipe) caused to flow over the tube and between the tube and the outer housing.

Pandaru fails to disclose: wherein the tube is helically corrugated. However, Corrugation is a frequently used method of increasing the heat exchange surface area

of a tube. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the device of Pandaru to specify the use of helically corrugated pipe within the heat exchanger, as a mechanical expedient to increase the heat exchange surface area of the pipe, thereby allowing for the transfer of more heat to greatly expedite the defrosting process.

With regards to claim 19, Pandaru et al. disclose: the low pressure side of the heat pump is provided with a heat exchanger (before and along evaporator 8); the method comprising providing the heat exchanger with a tube within an outer housing (see fig. 5), the working fluid being caused to flow over the tube and between the outer housing to be heated (col. 4, line 50-52) before it enters the evaporator (the tube begins to run immediately after the expansion valve).

Pandaru fails to disclose: where in the tube is helically corrugated. Corrugation is a frequently used method of increasing the heat exchange surface area of a tube. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the device of Pandaru to specify the use of helically corrugated pipe within the heat exchanger, as a mechanical expedient to increase the heat exchange surface area of the pipe, thereby allowing for the transfer of more heat to greatly expedite the defrosting process.

With regards to claim 30, Pandaru et al. fail to explicitly disclose: wherein the at least one sensor comprises a temperature sensor adapted to measure the temperature

of the outer surface of the evaporator. Pandaru merely says that the variable measured by the defrost sensor should be indicative of evaporator temperature. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention that the temperature on the surface of the evaporator pipes would be indicative of evaporator temperature because as the ice buildup on the pipes increases, the convection heat exchange of the evaporator will decrease, and the working fluid will no longer absorb heat from it's environment to warm the evaporator pipes.

With regards to claim 31, Pandaru et al. fail to explicitly disclose: wherein the at least one sensor comprises a temperature sensor adapted to measure the temperature of the working fluid exiting the evaporator. Pandaru merely says that the variable measured by the defrost sensor should be indicative of evaporator temperature. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention that the temperature of the working fluid in the evaporator pipes would be indicative of evaporator temperature because as the ice buildup on the pipes increases, the convection heat exchange of the evaporator will decrease, and the working fluid will no longer absorb heat from it's environment to increase it's temperature.

With regards to claim 32, Pandaru et al. fail to explicitly disclose: wherein the at least one sensor comprises a temperature sensor adapted to measure the temperature of the environment surrounding the evaporator. Pandaru merely says that the variable

measured by the defrost sensor should be indicative of evaporator temperature. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention that the temperature of the environment surrounding the evaporator would be indicative of evaporator temperature because as the ice buildup on the evaporator pipes increases, the temperature of the surroundings will also increase, as the working fluid will no longer absorb heat from it's environment, further cooling it.

With regards to claim 33, Pandaru et al. fail to explicitly disclose: wherein the at least one sensor comprises a pressure sensor adapted to measure the pressure of the working fluid exiting the evaporator. Pandaru merely says that the variable measured by the defrost sensor should be indicative of evaporator temperature. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention that the pressure of the working fluid exiting the evaporator would be indicative of the temperature of the evaporator, because temperature and pressure are directly correlated, as illustrated by the Ideal Gas Law, $PV=nRT$, and as the ice buildup on the pipes increases, the convection heat exchange of the evaporator will decrease, meaning the working fluid will no longer absorb heat from it's environment to increase it's temperature.

With regards to claim 39, Pandaru et al. disclose: wherein the heat exchanger comprises a tube (leading to condenser (2) positioned in an outer housing (surrounding heat exchange tank (5)), the working fluid (in heat exchanger housing/pipe) from the

high pressure side being caused to flow through the tube to add heat to the working fluid caused to flow over the tube and between the tube and the outer housing (see fig. 3).

Pandaru fails to disclose: wherein the tube is helically corrugated. However, Corrugation is a frequently used method of increasing the heat exchange surface area of a tube. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the device of Pandaru to specify the use of helically corrugated pipe within the heat exchanger, as a mechanical expedient to increase the heat exchange surface area of the pipe, thereby allowing for the transfer of more heat to greatly expedite the defrosting process.

With regards to claim 45, Pandaru et al. disclose: the low pressure side of the heat pump is provided with a heat exchanger (before and along evaporator 8); the method comprising providing the heat exchanger with a tube within an outer housing (see fig. 5), the working fluid being caused to flow over the tube and between the outer housing to be heated (col. 4, line 50-52) before it enters the evaporator (the tube begins to run immediately after the expansion valve).

Pandaru fails to disclose wherein the tube is helically corrugated. Corrugation is a frequently used method of increasing the heat exchange surface area of a tube. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the device of Pandaru to specify the use of helically corrugated pipe within the heat exchanger, as a mechanical expedient to increase the

heat exchange surface area of the pipe, thereby allowing for the transfer of more heat to greatly expedite the defrosting process.

3. Claims 2, 7, 8, 9, 11, 23, 24, 25, 26, 27, 17, 29, 34, 35, 36, 38, 47, 48, 49, 50, 51 and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pandaru in view of Heise (WO 96/34511).

With regards to claim 2, Pandaru et al. disclose: a heat pump apparatus comprising an evaporator means (4), a control means (10) in communication with at least one sensor means (8) adapted to measure one or more variables representative of a temperature of an outer surface of the evaporator means, a heat exchanger means (5) positioned upstream of the evaporator means and downstream of an expansion (pipe of heat exchanger means begins immediately after expansion capillary) means of the heat pump apparatus, the heat exchanger means (5) operable to add heat to a working fluid entering the evaporator, wherein the control means is operatively connected with the heat exchanger means so that when the control means determines that the temperature of the outer surface of the evaporator means is below a pre-selected temperature, the heat exchanger means adds heat to the working fluid (col. 4, line 40-43) thereby reducing or substantially eliminating formation of ice on the outer surface of the evaporator means, and wherein the heat exchanger comprises a tube (leading to condenser (2)) positioned within an outer housing (surrounding heat

exchange tank (5)), and the working fluid being heated is caused to flow over the tube and between the tube and the outer housing (see fig. 3).

Pandaru fails to disclose: wherein the heat exchanger means contains a heating element. Heise teaches: an electrical heating unit assembly suitable to keep fluid supply lines from frosting or freezing (pg. 1, line 21-23). The assembly is designed to be positioned in only a portion of the pipe, yet to keep the water upstream of it above freezing temperature. It would have been obvious to one having ordinary skill in the art at the time of the invention, to modify the device of Pandaru by the device of Heise so as to heat the heat exchange fluid electro-resistively instead of convectively because it would improve the efficiency, which is lowered by the loss of heat between the compressor and the condenser.

Pandaru fails to disclose: wherein the tube is helically corrugated. However, Corrugation is a frequently used method of increasing the heat exchange surface area of a tube. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the device of Pandaru to specify the use of helically corrugated pipe within the heat exchanger, as a mechanical expedient to increase the heat exchange surface area of the pipe, thereby allowing for the transfer of more heat to greatly expedite the defrosting process.

With regards to claim 7, Pandaru et al. in view of Heise fail to disclose: wherein the heat exchanger means comprises an electric heating element. However, Pandaru

discloses a heat exchanger means capable of being warmed electro-resistively instead of convectively, and Heise teaches a submersible heating element suitable for warming the heat exchanger of Pandaru. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention, to modify the device of Pandaru by the device of Heise so as to heat the heat exchange fluid electro-resistively instead of convectively because it would improve the efficiency, which is lowered by the loss of heat between the compressor and the condenser.

With regards to claim 8, Pandaru et al. in view of Heise fail to explicitly disclose: wherein the electric heating element extends through the helically corrugated tube. However, Heise wraps his element a protective sheath (pg. 3, line 3-6). A flexible, corrugated tube would be one such sheath. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to use a corrugated tube as a sheath before inserting the heating element into the refrigerant line, because it would prevent damage to the delicate heating element.

With regards to claim 9, Pandaru et al. in view of Heise fail to explicitly disclose: wherein the helically corrugated tube forms part of an electrical circuit of the electric heating element. However, Heise states that the sheath should preferably be metallic in nature (pg. 3, line 7). Running a heating element down a metallic material will by its very nature create an electric circuit. Therefore, it would have been obvious to one

having ordinary skill in the art at the time of the invention that the sheath is and should be part of the electric circuit of the electric heating element, because in no other way could it provide sufficient heat transfer.

With regards to claim 11, Pandaru et al. fail to disclose: wherein the pre-selected temperature is between about 4°C and 0°C. However, it would have been obvious to one having ordinary skill in the art at the time of the invention to have the system operate at and evaporator temperature of 4°C to 0°C, because the invention is designed to prevent the freezing of water, which freezes at 0°C.

With regards to claim 23, Pandaru et al. fail to explicitly disclose: wherein the at least one sensor means comprises a temperature sensor adapted to measure the temperature of the outer surface of the evaporator means. Pandaru merely says that the variable measured by the defrost sensor should be indicative of evaporator temperature. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention that the temperature on the surface of the evaporator pipes would be indicative of evaporator temperature because as the ice buildup on the pipes increases, the convection heat exchange of the evaporator will decrease, and the working fluid will no longer absorb heat from it's environment to warm the evaporator pipes.

With regards to claim 24, Pandaru et al. fail to explicitly disclose: wherein the at least one sensor means comprises a temperature sensor adapted to measure the temperature of the working fluid exiting the evaporator means. Pandaru merely says that the variable measured by the defrost sensor should be indicative of evaporator temperature. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention that the temperature of the working fluid in the evaporator pipes would be indicative of evaporator temperature because as the ice buildup on the pipes increases, the convection heat exchange of the evaporator will decrease, and the working fluid will no longer absorb heat from it's environment to increase it’s temperature.

With regards to claim 25, Pandaru et al. fail to explicitly disclose: wherein the at least one sensor means comprises a temperature sensor adapted to measure the temperature of the environment surrounding the evaporator means. Pandaru merely says that the variable measured by the defrost sensor should be indicative of evaporator temperature. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention that the temperature of the environment surrounding the evaporator would be indicative of evaporator temperature because as the ice buildup on the evaporator pipes increases, the temperature of the surroundings will also increase, as the working fluid will no longer absorb heat from it’s environment, further cooling it.

With regards to claim 26, Pandaru et al. fail to explicitly disclose: wherein the at least one sensor means comprises a pressure sensor adapted to measure the pressure of the working fluid exiting the evaporator means. Pandaru merely says that the variable measured by the defrost sensor should be indicative of evaporator temperature. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention that the pressure of the working fluid exiting the evaporator would be indicative of the temperature of the evaporator, because temperature and pressure are directly correlated, as illustrated by the Ideal Gas Law, $PV=nRT$, and as the ice buildup on the pipes increases, the convection heat exchange of the evaporator will decrease, meaning the working fluid will no longer absorb heat from it's environment to increase it's temperature.

With regards to claim 27, Pandaru et al. disclose: a system comprising a compressor (1) and a condenser (2) and where the heat exchanger means (5) obtains heat from the working fluid between the compressor and the condenser to transfer the heat to the working fluid entering the evaporator means (see fig. 3).

With regards to claim 17, Pandaru et al. fail to disclose wherein the method comprises heating the working fluid entering the evaporator with an electric heating element. Heise teaches: an electrical heating unit assembly suitable to keep fluid supply lines from frosting or freezing (pg. 1, line 21-23). The assembly is designed to be positioned in only a portion of the pipe, yet to keep the water upstream of it warm and

flowing. It would have been obvious to one having ordinary skill in the art at the time of the invention, to modify the device of Pandaru by the device of Heise to provide similar even heating via a heating element running coaxially to the evaporator pipes, because it would have fewer moving parts to potentially break and take less space in unit, while still preventing the undesirable point heating which Pandaru teaches against.

With regards to claim 29, Pandaru et al. disclose: a heat pump apparatus comprising an evaporator (4), a controller (10) in Communication with at least one sensor (8) adapted to measure one or more variables representative of a temperature of an outer surface of the evaporator, and a heat exchanger [[means]] (5) positioned upstream of the evaporator and downstream of an expansion valve of the heat pump apparatus (the pipe begins immediately after the expansion capillary, the heat exchanger [[means]] operable to add heat to a working fluid entering the evaporator, wherein the controller is operatively connected with the heat exchanger so that when the controller determines that the temperature of the outer surface of the evaporator is below a pre-selected temperature, the heat exchanger adds heat to the working fluid (col. 4, line 40-43) thereby reducing or substantially eliminating formation of ice on the outer surface of the evaporator, and wherein the heat exchanger comprises a tube (leading to condenser (2)) positioned within an outer housing (surrounding heat exchange tank (5)), and the working fluid being heated is caused to flow over the tube and between the tube and the outer housing (see fig. 3).

Pandaru fails to disclose: wherein the heat exchanger means contains a heating element. Heise teaches: an electrical heating unit assembly suitable to keep fluid supply lines from frosting or freezing (pg. 1, line 21-23). The assembly is designed to be positioned in only a portion of the pipe, yet to keep the water upstream of it above freezing temperature. It would have been obvious to one having ordinary skill in the art at the time of the invention, to modify the device of Pandaru by the device of Heise so as to heat the heat exchange fluid electro-resistively instead of convectively because it would improve the efficiency, which is lowered by the loss of heat between the compressor and the condenser.

Pandaru fails to disclose wherein the tube is helically corrugated. Corrugation is a frequently used method of increasing the heat exchange surface area of a tube. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the device of Pandaru to specify the use of helically corrugated pipe within the heat exchanger, as a mechanical expedient to increase the heat exchange surface area of the pipe, thereby allowing for the transfer of more heat to greatly expedite the defrosting process.

With regards to claim 34, Heise discloses: wherein the heat exchanger comprises an electric heating element (pg. 1, line 24-26).

With regards to claim 35, Pandaru et al in view of Heise fail to explicitly disclose: wherein the electric heating element extends through the helically corrugated tube.

However, Heise wraps his element a protective sheath (pg. 3, line 3-6). A flexible, corrugated tube would be one such sheath. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to use a corrugated tube as a sheath before inserting the heating element into the refrigerant line, because it would prevent damage to the delicate heating element.

With regards to claim 36, Pandaru et al in view of Heise fail to explicitly disclose: wherein the helically corrugated tube forms part of an electrical circuit of the electric heating element. . However, Heise states that the sheath should preferably be metallic in nature (pg. 3, line 7). Running a heating element down a metallic material will by its very nature create an electric circuit. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention that the sheath is and should be part of the electric circuit of the electric heating element, because in no other way could it provide sufficient heat transfer.

With regards to claim 38, Pandaru et al. fail to disclose: wherein the pre-selected temperature is between about 4°C and 0°C. However, it would have been obvious to one having ordinary skill in the art at the time of the invention to have the system operate at and evaporator temperature of 4°C to 0°C, because the invention is designed to prevent the freezing of water, which freezes at 0°C.

With regards to claim 47, Pandaru et al. fail to explicitly disclose: wherein the at least one sensor comprises a temperature sensor adapted to measure the temperature of the outer surface of the evaporator. Pandaru merely says that the variable measured by the defrost sensor should be indicative of evaporator temperature. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention that the temperature on the surface of the evaporator pipes would be indicative of evaporator temperature because as the ice buildup on the pipes increases, the convection heat exchange of the evaporator will decrease, and the working fluid will no longer absorb heat from it's environment to warm the evaporator pipes.

With regards to claim 48, Pandaru et al. fail to explicitly disclose: wherein the at least one sensor comprises a temperature sensor adapted to measure the temperature of the working fluid exiting the evaporator. Pandaru merely says that the variable measured by the defrost sensor should be indicative of evaporator temperature. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention that the temperature of the working fluid in the evaporator pipes would be indicative of evaporator temperature because as the ice buildup on the pipes increases, the convection heat exchange of the evaporator will decrease, and the working fluid will no longer absorb heat from it's environment to increase it’s temperature.

With regards to claim 49, Pandaru et al. fail to explicitly disclose: wherein the at least one sensor comprises a temperature sensor adapted to measure the temperature of the environment surrounding the evaporator. Pandaru merely says that the variable measured by the defrost sensor should be indicative of evaporator temperature. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention that the temperature of the environment surrounding the evaporator would be indicative of evaporator temperature because as the ice buildup on the evaporator pipes increases, the temperature of the surroundings will also increase, as the working fluid will no longer absorb heat from it's environment, further cooling it.

With regards to claim 50, Pandaru et al fail to explicitly disclose: wherein the at least one sensor comprises a pressure sensor adapted to measure the pressure of the working fluid exiting the evaporator. Pandaru merely says that the variable measured by the defrost sensor should be indicative of evaporator temperature. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention that the pressure of the working fluid exiting the evaporator would be indicative of the temperature of the evaporator, because temperature and pressure are directly correlated, as illustrated by the Ideal Gas Law, $PV=nRT$, and as the ice buildup on the pipes increases, the convection heat exchange of the evaporator will decrease, meaning the working fluid will no longer absorb heat from it's environment to increase it's temperature.

With regards to claim 51, Pandaru et al. disclose: further comprising a compressor (1) and a condenser (2) and where the heat exchanger (5) obtains heat from the working fluid between the compressor and the condenser to transfer the heat to the working fluid entering the evaporator (see fig. 3).

With regards to claim 43, Pandaru et al. fail to disclose: wherein the method comprises heating the working fluid entering the evaporator with an electric heating element. Heise teaches: an electrical heating unit assembly suitable to keep fluid supply lines from frosting or freezing (pg. 1, line 21-23). The assembly is designed to be positioned in only a portion of the pipe, yet to keep the water upstream of it warm and flowing. It would have been obvious to one having ordinary skill in the art at the time of the invention, to modify the device of Pandaru by the device of Heise to provide similar even heating via a heating element running coaxially to the evaporator pipes, because it would have fewer moving parts to potentially break and take less space in unit, while still preventing the undesirable point heating which Pandaru teaches against.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to STEPHANIE MCLAREN whose telephone number is (571) 270-7127. The examiner can normally be reached on Monday, Tuesday, Thursday 9:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frantz Jules &. Cheryl Tyler can be reached on (571) 272-6681 & (571)-272-4834. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/SDM/

5/4/09

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